

Application No. 09/864,335  
Reply to Office Action of June 2, 2003

REMARKS

Favorable reconsideration of the present application is respectfully requested.

Claims 1-5, 7, 8 and 10 are active in the application.

The format of Claim 8 has been modified in light of the objection thereto. In addition, Claims 3, 4, 5 and 8 have been amended in light of the objections thereto, and now use language based upon that found at lines 8-11 of page 41 of the specification. The rejection under 35 U.S.C. § 112 is therefore believed to have been overcome.

Claims 5-7 again stand rejected under 35 U.S.C. § 103 as being obvious over the U.S. patent to Saijo et al in view of the U.S. patent to Shoji '228. Moreover, Claims 8-10 stand rejected under 35 U.S.C. § 103 as being obvious over the U.S. patent to Nagao in view of Shoji '228. Claims 1-4 stand rejected, based on obviousness type double patenting, as being obvious over Claims 1-4 of U.S. patent 6,456,806 in view of Shoji '228. In each case, Shoji '228 was cited to teach the use of an AC bias in the developing device of the primary reference.

Applicants had previously argued that the combination of the cited references (using Saijo et al and Nagao as the primary references) would not have been obvious to those skilled in the art, in light of the superior results set forth in the specification, e.g., at Figs. 14-15. In response, the Examiner has merely pointed out that "it is conventional in the art to use a bias with [an] oscillation component" as disclosed in Shoji '228. This, however, ignores the evidence of unexpectedly superior results set forth in the specification.

It is the Examiner's position that Shoji '228, in combination with either Saijo (Claims 5 and 7) or Nagao (Claims 8 and 10) or the Claims 1-4 of U.S. patent 6,456,806 (Claims 1-4)

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presents a *prima facie* case of obviousness (or obviousness type double patenting) of the rejected claims, based upon the fact that Shoji '228 discloses a developing device using a bias with an oscillation component. However, even if the cited references create a *prima facie* case of obviousness (something which is not admitted) **any such *prima facie* case can be rebutted by evidence of superior or unexpected results.** See MPEP § 716.02-§ 716.02(g). Evidence of superior results as compared to the closest prior art is, in fact, abundantly present in the comparative tests described in the specification.

An “edge effect” and “granularity” are problems present in the prior art (page 3, lines 23-25). It is therefore an object of the present invention to free an image from the problems of granularity and the omission of a trailing edge (page 4, lines 21-23). To this end, Claim 1 recites an image forming apparatus in which a ratio of a distance between an image carrier and the developer carrier, as measured at a boundary of a nip for development, to a shortest distance between the image carrier and the developer carrier (noted in Figure 11 as a “Boundary Distance/Nip Distance”) is 1.5 or below, *and* an electric field including an oscillation component (AC bias) is formed between the image carrier and the developer carrier.

Figure 11 shows the results of experiments conducted in order to estimate the degree of granularity and trailing edge omission under a variety of conditions. Tests 1-4, 6, 8 and 10 were conducted with DC bias only, and so constituted comparative examples. Under the category “omission rank”, which was indicative of the trailing edge omission, a rank of 5 indicates that no omission was observed while a rank of “1” indicates that the omission was undesirably conspicuous. Similarly, for the “granularity rank” category, a rank of “5”

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indicates no granularity while a rank of "1" indicates granularity was most conspicuous (page 38, lines 8-15). As is evident from Figure 11, none of the comparative examples 1-4, 6, 8 and 10 had a granularity rank score higher than 2.

Additionally, while tests 5, 7 and 9 using an AC bias scored high granularity ranks of 3, 4.5 and 4.5, respectively, the trailing edge omission rank for test 5 was a low value of "3" while the omission rank for tests 7 and 9 had higher values of "4.5." These latter tests 7 and 9 were conducted at a boundary distance/nip distance ratio of 1.13 and 1.2, respectively -- that is, less than 1.5. On the other hand, test 5 having the relatively low trailing edge omission rank value of 3, was performed with a boundary distance/nip distance ratio of 1.97. **Thus, it was only in the case of tests 7 and 9 -- having both the claimed boundary distance/nip distance ratio of 1.5 or less, and an AC bias -- that both the trailing edge omission rank and the granularity rank scored high values** (see page 38, line 16 through page 39, line 17).

Applicants respectfully submit that Figure 11 provides evidence of superior results which overcome any *prima facie* case of obviousness of Claims 1-4 which may be established by the cited prior art. Figure 11 compares the result of test samples corresponding to the invention recited in Claim 1 (tests 7 and 9) with comparative examples which differ only as to the boundary distance/nip distance ratio or which lack AC bias. Figure 11 establishes unexpectedly superior results only in the case of a *combination* of the claimed boundary distance/nip distance and an AC bias. Applicants therefore respectfully submit that any *prima facie* case of obviousness as to Claim 1 has been overcome by the data of Figure 11, and respectfully request that the double patenting rejection of Claims 1-4 be

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withdrawn.

Claim 5 recites a ratio of a shortest distance between the image carrier and the developer carrier to a shortest distance between the developer carrier and a metering member, which regulates the developer (also called the  $G_p/G_d$  ratio), is smaller than 0.8, in combination with an AC bias. Here again, the specification provides clear evidence of unexpectedly superior results for the claimed subject matter.

Figure 14 shows the results of tests in which the  $G_p/G_d$  ratio was varied, both with and without AC bias (page 44, lines 18-21). Figure 15 shows comparative examples in which a conventional magnet roller was used (page 45, lines 7-10). Referring to Figure 14, using only a DC bias, the granularity rank did not exceed 1.5 for any of the tests. (In Figure 15, it did not exceed 1). Moreover, even with the use of an AC bias, the granularity rank for the first 8 tests (within the claimed  $G_p/G_d$  ratio) was 4.5 to 3.5, whereas the granularity ranks for the last two tests (outside of the claimed  $G_p/G_d$  ratio) were 3 and 2, respectively. (The trailing edge omission ranks in Figure 15 were all low). Thus, the specification provides clear evidence of superior results derived from the combination of the claimed  $G_p/G_d$  ratio and an AC bias, and so any *prima facie* case of obviousness of Claim 5 is overcome thereby.

Claim 8 recites an embodiment in which the ratio of the shortest distance between the image carrier and the developer carrier to the amount of developer scooped up to the image carrier (i.e., the  $G_p/\rho$  ratio) is smaller than 10 mm/g cm<sup>2</sup>, under the condition of an oscillating bias. Referring to Figure 16, it is seen that the tests in which an AC bias is present, in combination with a  $G_p/\rho$  ratio of less than 10 (i.e., the first six tests in Figure 16) produced a granularity rank value of 4 or higher, as compared to granularity ranks of 3.5 or less in the

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comparative examples. (As with Figure 15, Figure 17 shows comparative examples in which a conventional magnet roller was used, with low trailing edge omission results). Again, the evidence of superior results for the claimed invention set forth in the specification overcomes any *prima facie* case of obviousness which may have been raised by the cited prior art.

In summary, the Examiner's position is simply that the claimed ratios are taught in certain prior art, and that since AC biases, *per se*, are known, the combination of these ratios with an AC bias would have been obvious to those skilled in the art. The Examiner, however, has not addressed the evidence of unexpectedly superior results set forth in the specification for such a combination. This evidence of criticality overcomes any *prima facie* case of obviousness which may be put forth by the prior art. The rejections are therefore improper, and their withdrawal is respectfully solicited.

Applicants therefore believe that the present application is in condition for allowance and respectfully solicit and early Notice of Allowability.

Respectfully submitted,

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